

Aminopyralid

Roadside Vegetation Management Herbicide Fact Sheet



This fact sheet was developed by Oregon State University and Intertox, Inc. to assist interested parties in understanding the risks associated with pesticide use in Washington State Department of Transportation's (WSDOT) Integrated Vegetation Management program.

Introduction

Aminopyralid is a pyridine carboxylic acid herbicide used to control susceptible broadleaf weeds, including noxious and invasive weeds. Aminopyralid disrupts plant growth metabolic pathways, affecting the growth process of the plant. Aminopyralid is the only active ingredient in the herbicide product **Milestone** (40.6%). According to the product label, **Milestone** also contains 59.4% inert ingredients (unspecified). The Washington State Department of Transportation (WSDOT) uses **Milestone** for selective broadleaf treatment. **Milestone** also has uses in rangeland, permanent grass pastures, natural areas, and grazed areas.

WSDOT assessed the potential risks to human, wildlife, and aquatic animals exposed to aminopyralid in their Integrated Vegetation Management (IVM) program. Evaluating potential risks takes into account both the toxicity of a pesticide and the characteristics of possible exposure.

WSDOT Application Rates and Use Patterns on Highway Rights-of-Way

Milestone is applied at a maximum of 7 fluid ounces per acre per year, which is equivalent to 0.11 pounds of the active ingredient aminopyralid per acre per year. Where used, WSDOT's typical application rate of **Milestone** is equivalent to about 0.093 pounds of aminopyralid per acre per year. Applicators will use truck mounted hand-guns or booms, hose reels, or backpack sprayers to make a single applications of aminopyralid in the spring or summer.

Laboratory Testing: Before pesticides are registered by the U.S. Environmental Protection Agency (EPA), they must undergo laboratory testing for short-term (acute) and long-term (chronic) health effects. Laboratory animals are purposely fed doses high enough to cause toxic effects. These tests help scientists determine how chemicals might affect humans, domestic animals, or wildlife in cases of overexposure. Pesticide products used according to label directions are unlikely to cause toxic effects. The amount of pesticide that people and pets may be exposed to is low compared to the doses fed to laboratory animals.

Human Health Effects

The U.S. Environmental Protection Agency (U.S. EPA) classifies **Milestone** as category IV (Low Toxicity) with a signal word of CAUTION (see "Toxicity Category and Signal Word" table).

Acute toxicity: Aminopyralid has very low toxicity if individuals accidentally eat, touch, or inhale residues. Aminopyralid did not result in skin sensitization when tested on guinea pigs or skin irritation when tested on rabbits. Aminopyralid by itself caused eye irritation in rabbits, but in the **Milestone** product formulation it did not.

LD50/LC50: Acute toxicity is commonly measured by the lethal dose (LD) or lethal concentration (LC) that causes death in 50 percent of treated laboratory animals. LD50 indicates the dose of a chemical per unit body weight of an animal and is expressed as milligrams per kilogram (mg/kg). LC50 is the concentration of a chemical per volume of air or water and is expressed as milligrams per liter (mg/L). Chemicals are highly toxic when the LD50 or LC50 value is small and practically nontoxic when the value is large. However, the LD50 and LC50 do not reflect potential health effects such as cancer, birth defects, or reproductive toxicity that may occur at levels of exposure below those that cause death.

Chronic toxicity: The lowest chronic doses of aminopyralid that have resulted in adverse effects occurred in a study in which rats were fed aminopyralid. The effects included decreased body weight and enlargement of the intestines and mucous membranes. In other chronic studies with mice and dogs, effects were seen at higher doses.

Reproductive effects: In a 2-generation reproduction study in rats, there was no evidence of parental, reproductive, or offspring toxicity observed after exposure to aminopyralid at the highest doses tested.

Carcinogenic effects: Aminopyralid is classified by U.S. EPA as “not likely” to be carcinogenic to humans. There were no increases in any tumors in studies with rats or mice.

Fate in humans and animals: In a metabolism study in rats, aminopyralid was excreted unchanged, indicating an absence of metabolism. Repeated administration of aminopyralid was not associated with bioaccumulation (build up) in tissues.

Toxicity Category and Signal Word

	High Toxicity (<i>Danger</i>)	Moderate Toxicity (<i>Warning</i>)	Low Toxicity (<i>Caution</i>)	Very Low Toxicity (<i>Caution</i>)
Oral LD50	Less than 50 mg/kg	50-500 mg/kg	500-5000 mg/kg	Greater than 5000 mg/kg
Dermal LD50	Less than 200 mg/kg	200-2000 mg/kg	2000-5000 mg/kg	Greater than 5000 mg/kg
Inhalation LC50	Less than 0.05 mg/l	0.05-0.5 mg/l	0.5-2.0 mg/l	Greater than 2.0 mg/l
Eye Effects	Corrosive	Irritation persisting for 7 days	Irritation reversible in 7 days	Minimal effects, gone in 24 hrs
Skin Effects	Corrosive	Severe irritation at 72 hours	Moderate irritation at 72 hours	Mild or slight irritation

Note: Highlighted categories specify the range for aminopyralid use cited in this fact sheet.

Wildlife and Aquatic Effects

Effects on mammals: Aminopyralid is practically non-toxic to mammals based on an oral LD50 > 5,000 mg/kg in acute oral toxicity studies with rats.

Effects on birds: Aminopyralid is practically non-toxic to avian species based on acute exposure of bobwhite quail that resulted in an LD50 value >2,250 mg/kg. In 5-day dietary studies with bobwhite quail and mallard duck, LC50 concentrations were >5,000 mg/kg.

Wildlife Toxicity Category

Risk Category	Mammals	Birds	Fish or Aquatic Insects
	Acute Oral or Dermal LD ₅₀ (mg/kg)	Acute Oral LD ₅₀ (mg/kg)	Acute LC ₅₀ (mg/L)
Practically nontoxic	>2,000	>2,000	>100
Slightly toxic	501-2,000	501-2,000	>10-100
Moderately toxic	51-500	51-500	>1-10
Highly toxic	10-50	10-50	0.1-1
Very highly toxic	<10	<10	<0.1

Note: Highlighted categories specify the range for aminopyralid use cited in this fact sheet.

Effects on fish: Aminopyralid is practically non-toxic to fish based on acute toxicity tests. Acute 96-hour LC50 values for sunfish, rainbow trout and sheepshead minnow were all >100 mg/L.

Effects on aquatic insects: Aminopyralid is practically non-toxic to slightly toxic to aquatic invertebrates based on acute toxicity tests reviewed by U.S. EPA. For *Daphnia magna* a 48-hour EC50 >98.6 mg/L was reported. For estuarine marine invertebrates, U.S. EPA reported a 48-hour EC50 >89 mg/L for Eastern oyster and an LC50 >100 mg a.e./L for Mysid. A study reviewed by the manufacturer reported an EC50 of >460 mg/L for acute immobilization in *Daphnia magna*.

Environmental Fate

The half-life of aminopyralid in soils ranges from 32 to 533 days, with a typical time of 103 days (see “Half-life” text box). Microbes and sunlight break it down. Aminopyralid shows moderate mobility in the environment and with a moderate potential to leach through soils and contaminate groundwater. It does not bioconcentrate (build up) through the food chain. Aminopyralid is systemic and is adsorbed through the leaves and the roots where it is transported to other parts of the plant.

Half-life is the time required for half of the compound to degrade.

1 half-life	= 50% degraded
2 half-lives	= 75% degraded
3 half-lives	= 88% degraded
4 half-lives	= 94% degraded
5 half-lives	= 97% degraded

Remember: the amount of a chemical remaining after a half-life will always depend on the amount of the chemical originally applied.

Human Health Risk Assessment

WSDOT evaluated several human exposure scenarios, including workers applying herbicides and the public (adults and children) picking and eating drift-contaminated berries, eating drift-contaminated garden vegetables, and walking through sprayed vegetation. For each exposure scenario, WSDOT evaluated conditions of average exposure and extremely conservative conditions of maximum exposure (see “Human Cancer/Non-cancer Risk Classification” text box and “Human Risk Classification for Average Exposure Scenarios” table).

Aminopyralid is expected to pose negligible potential risks of adverse non-cancer effects to WSDOT workers and the public under conditions of average and maximum exposure. All hazard quotients are below 1. Aminopyralid is not regulated as a carcinogen.

Human Cancer/Non-cancer Risk Classification:

Scientists estimate non-cancer health risks by generating a hazard quotient (HQ). This number is the exposure divided by the toxicity. When the HQ is less than 1, exposures are unlikely to cause any adverse health effects. When the HQ is greater than 1, the potential for non-cancer health effects should be considered. Risk assessments for chemicals that cause cancer (carcinogens) estimate the probability of an individual developing cancer over a lifetime. Cancer risks estimated in this way are very conservative, and actual cancer risks are likely to be much lower. Cancer risk estimates of less than 1 in 100,000 are within the range considered negligible by most regulatory

Wildlife Risk Assessment

Wildlife risk assessment considers herbicide behavior in the environment and routes of exposure. Indirect exposure to mammals and birds can occur when they eat contaminated prey or vegetation. Direct exposure can occur when mammals and birds contact herbicide residues with their skin or eyes or when they inhale vapors or particulates. WSDOT’s current application rates and use patterns for aminopyralid pose an insignificant risk to mammals and birds. The estimated dietary exposures to rats, mice, and meadow voles from maximum label application rates would be approximately 38,000, 4,500, and 5,900-fold lower, respectively, than the acute dietary LD50 for rats. The estimated dietary exposures to bobwhite quail, marsh wrens, and American robins from WSDOT’s application practices would be approximately 11,000, 1,200, and 950-fold lower, respectively, than the acute dietary LD50 for bobwhite quail.

Human Risk Classifications for Average Exposure Scenarios

Hazard Quotient (Non-cancer Risk)	Cancer Risk	Potential Risks and Management Priority
Less than 1	Less than 1 in 100,000	Negligible
Between 1 and 10	Between 1 in 10,000 and 1 in 100,000	Low
Between 10 and 100	Between 4 in 1,000 and 1 in 10,000	Moderate
Greater than 100	Greater than 4 in 1,000	High

Note: Highlighted categories specify the range of potential risk for specific exposure scenarios involving aminopyralid.

Aquatic Risk Assessment

WSDOT takes extra precautions applying herbicides near open water, wetlands, and wellhead protection zones. However, contamination may result from application drift, rainfall runoff, or residue leaching through the soil into groundwater. Fish and aquatic insect exposure to aminopyralid occurs primarily through direct contact with contaminated surface waters. Due to its relatively low toxicity and low application rates, the estimated risks to fish and aquatic invertebrates from WSDOT's use patterns for aminopyralid are estimated to be low in all areas of the state.

Additional Resources

- National Pesticide Information Center 1-800-858-PEST (7378) and <http://npic.orst.edu>
- Washington State Department of Transportation, Roadside Maintenance Branch 1-360-705-7865
- Washington Department of Agriculture, Pesticide Management Division 1-877-301-4555 (toll free)